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Dobashi et al.

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(54) **IMAGING DEVICE, MANUFACTURING DEVICE, AND MANUFACTURING METHOD**

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(73) Assignee: **Sony Corporation**, Tokyo (JP)

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H01L 27/146 (2006.01)
G02B 5/20 (2006.01)

(52) **U.S. Cl.**
CPC ***H04N 5/2254*** (2013.01); ***G02B 5/208*** (2013.01); ***H01L 27/14618*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC G02B 27/0006; H04N 5/2254; H04N 5/2253; H01L 27/14685; H01L 27/14623
See application file for complete search history.

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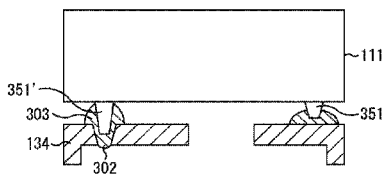
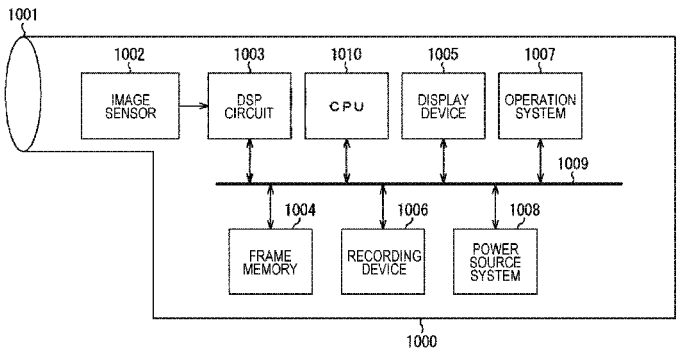
(57) **ABSTRACT**

The present technology relates to an imaging device, a manufacturing device, and a manufacturing method that enable a reliable manufacturing device to be manufactured without an increase in the number of manufacturing steps. A substrate on which an image sensor is mounted, a frame that fixes an infrared cut filter (IRCF), and a unit including a lens are included. The image sensor is sealed by the substrate, the IRCF, and the frame. A vent connected to a space in which the image sensor is sealed is provided in a part of the frame. The vent is blocked by a member that bonds the unit and the frame together. The vent is provided in the frame, in a predetermined shape, and in a vertical direction with respect to a surface to which the member is applied. The present technology can be applied to the imaging device.

9 Claims, 13 Drawing Sheets





(52) **U.S. Cl.**
CPC .. ***H01L 27/14623*** (2013.01); ***H01L 27/14625*** (2013.01); ***H01L 27/14685*** (2013.01); ***H04N 5/2253*** (2013.01)

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FIG. 1

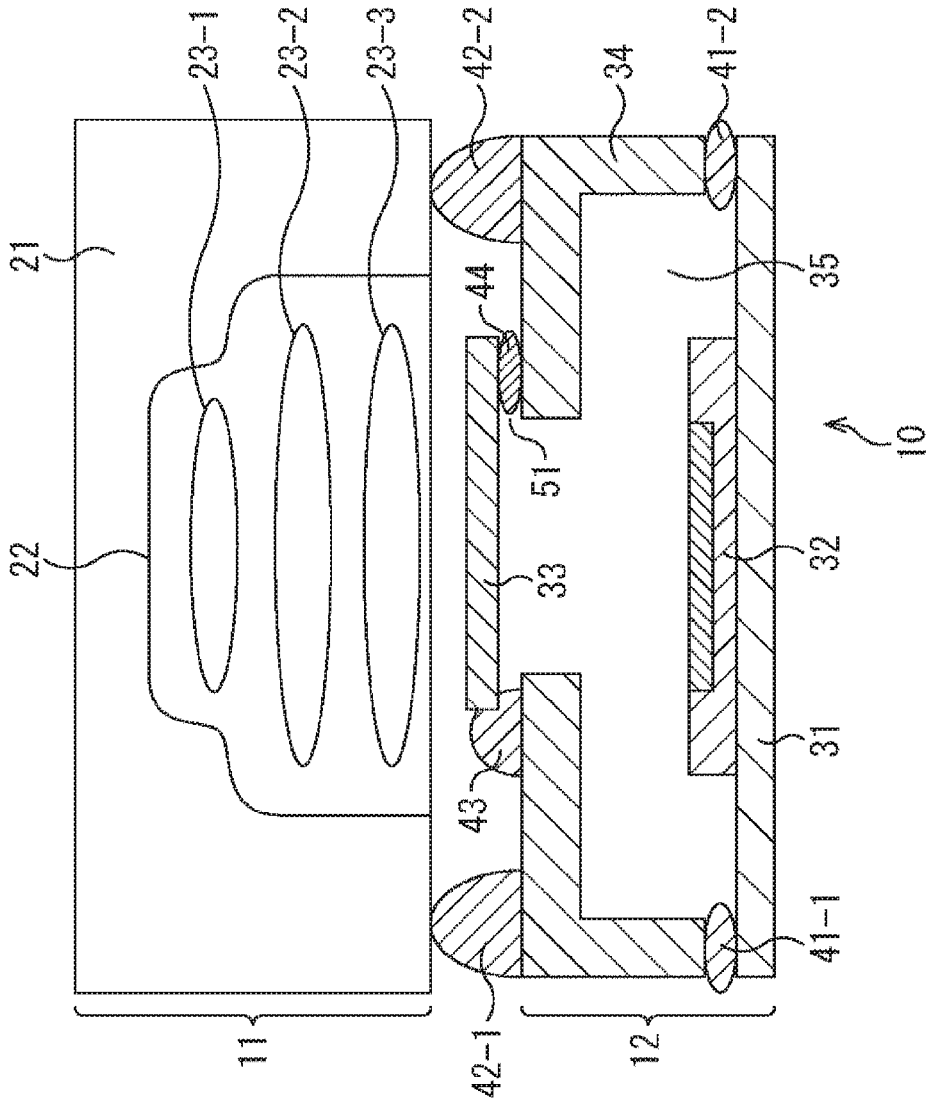


FIG. 2

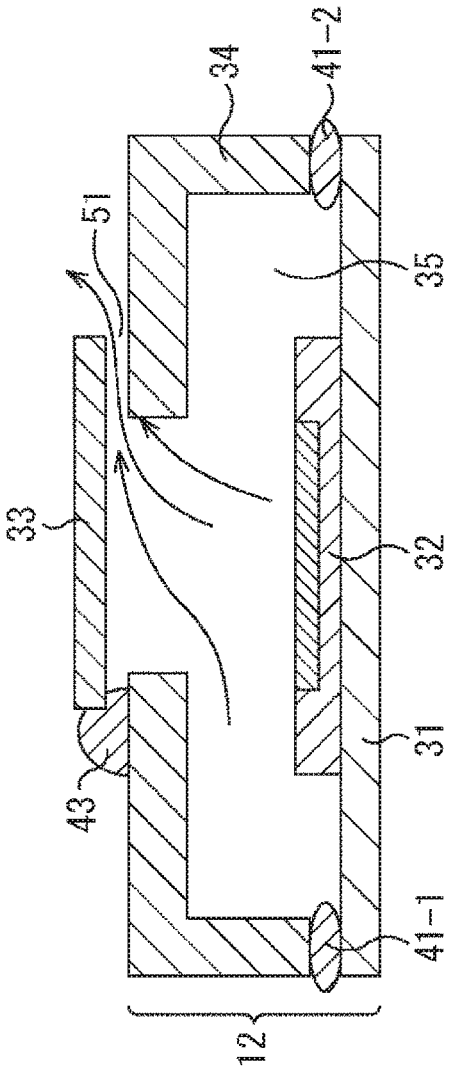


FIG. 3

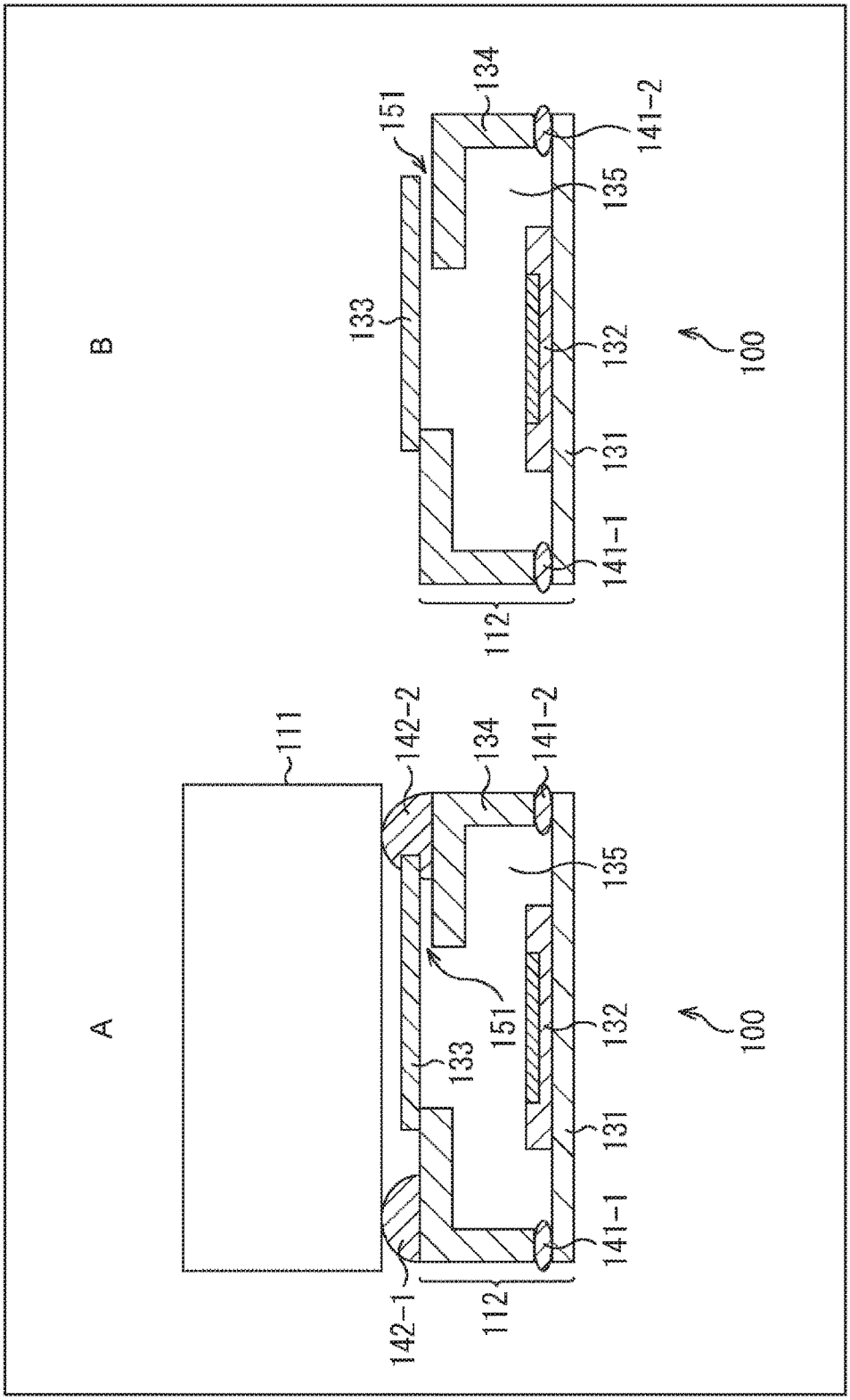
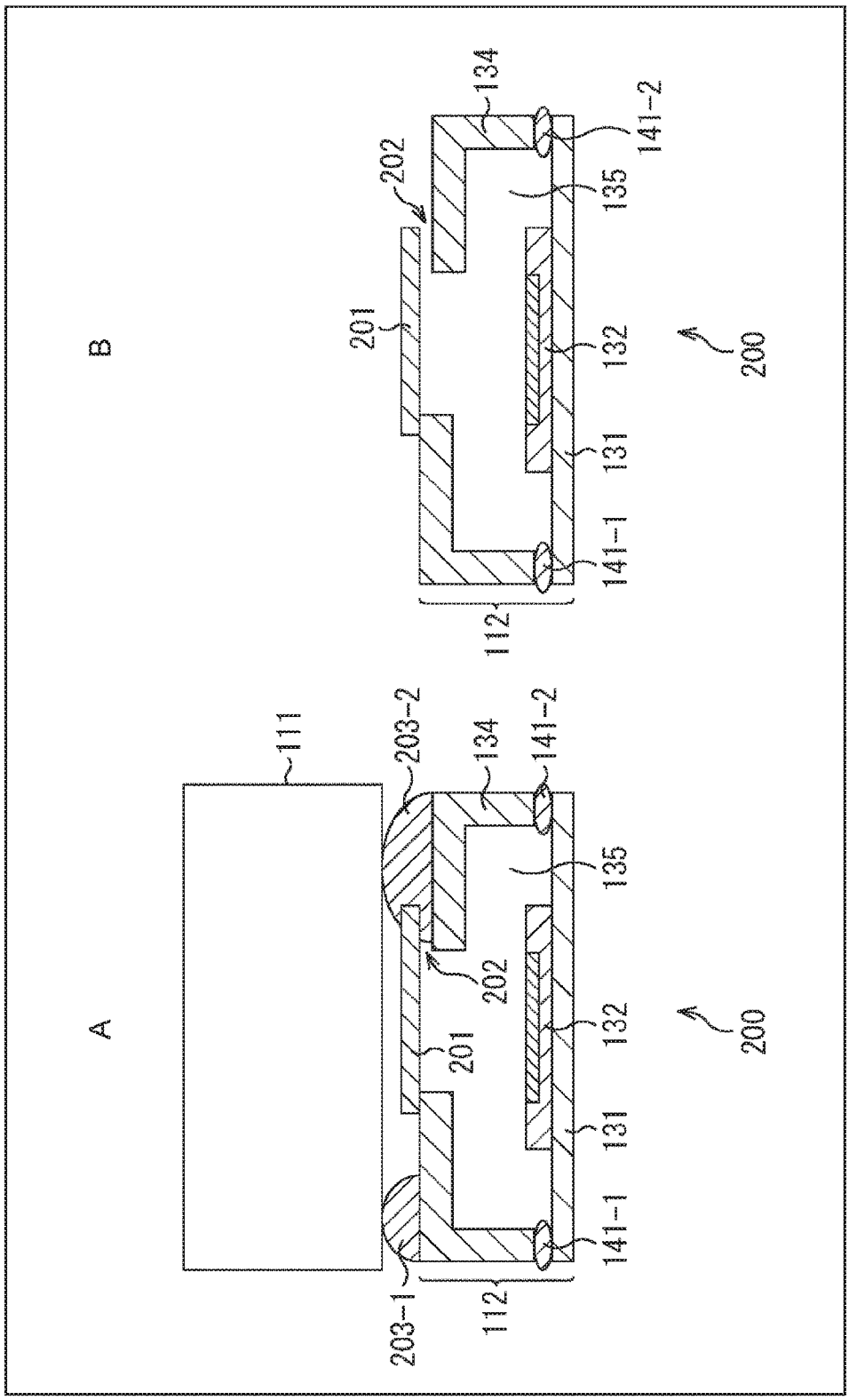


FIG. 4



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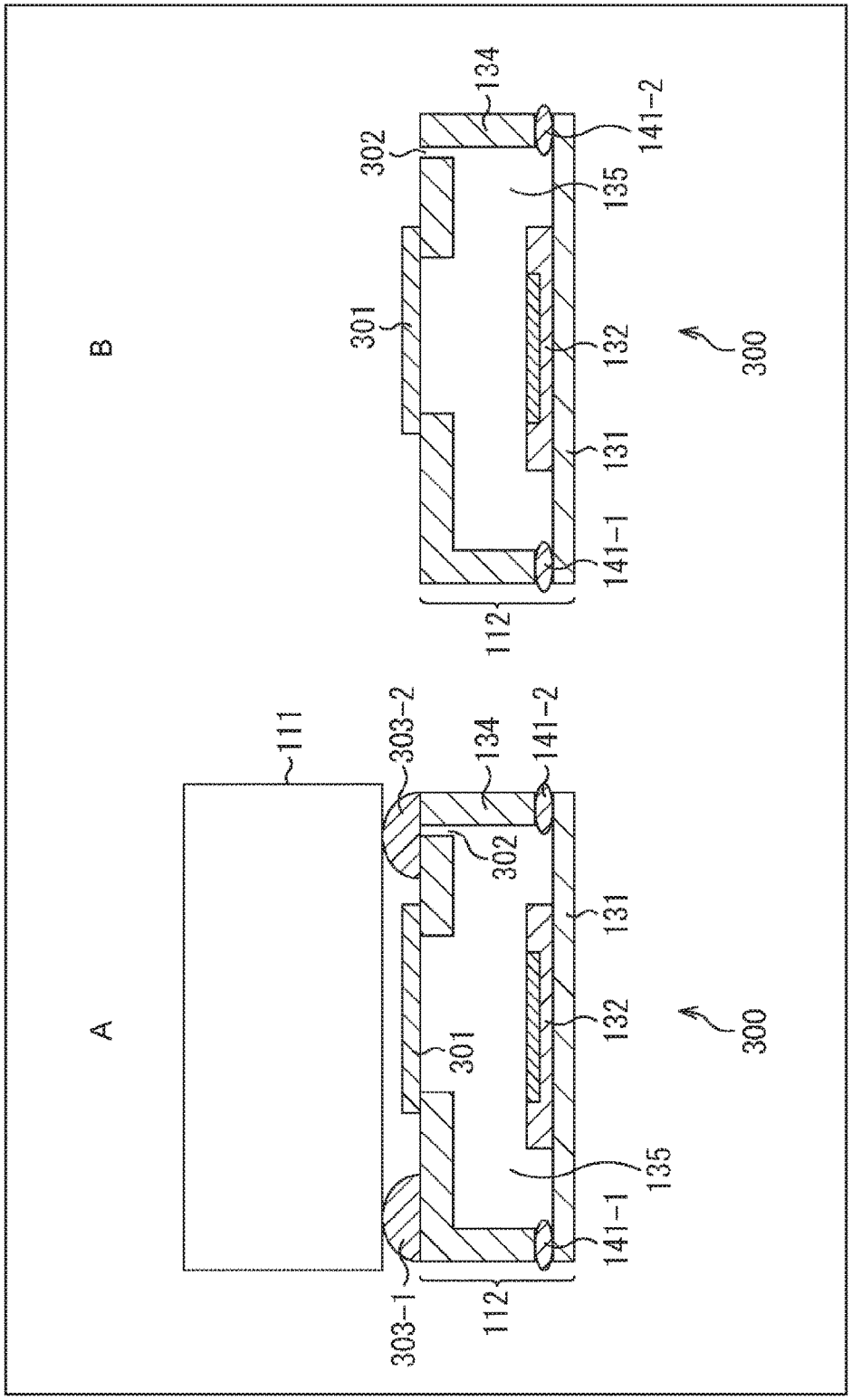
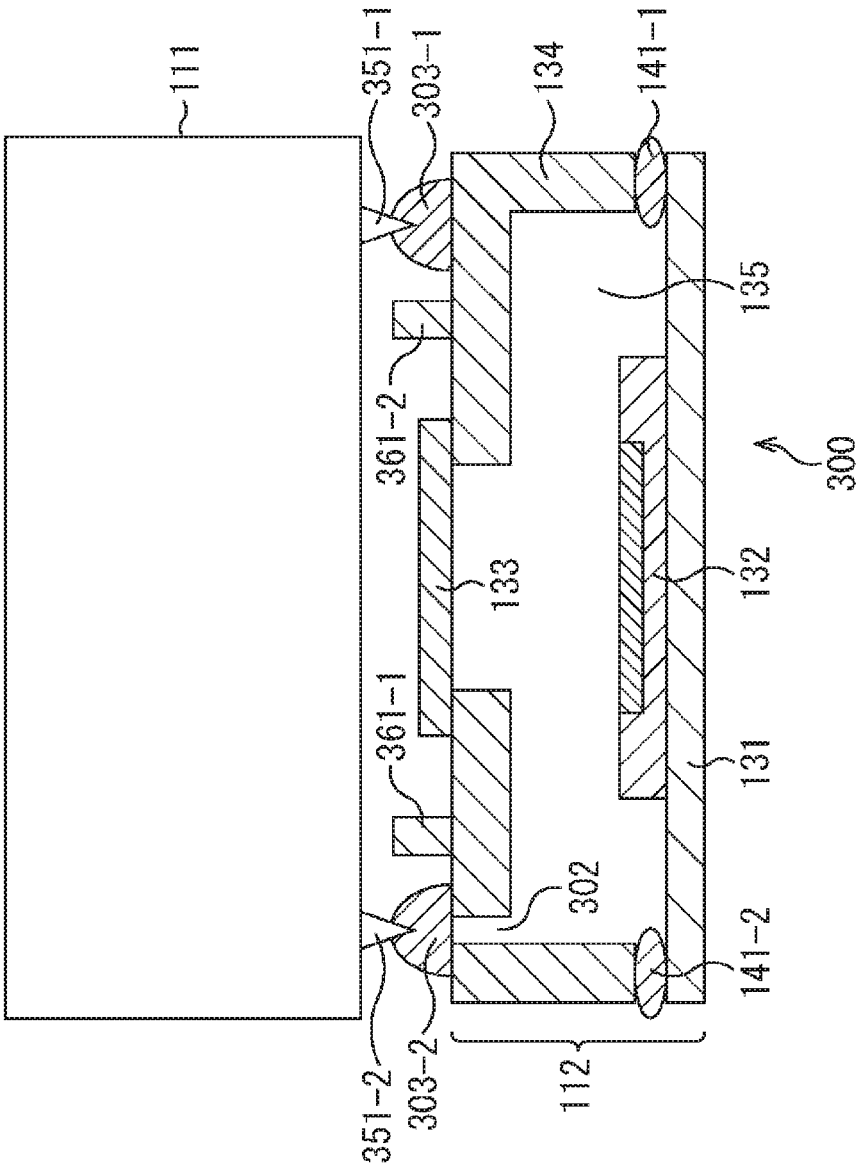


FIG. 6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141-2
351-2
303-2
112

FIG. 7

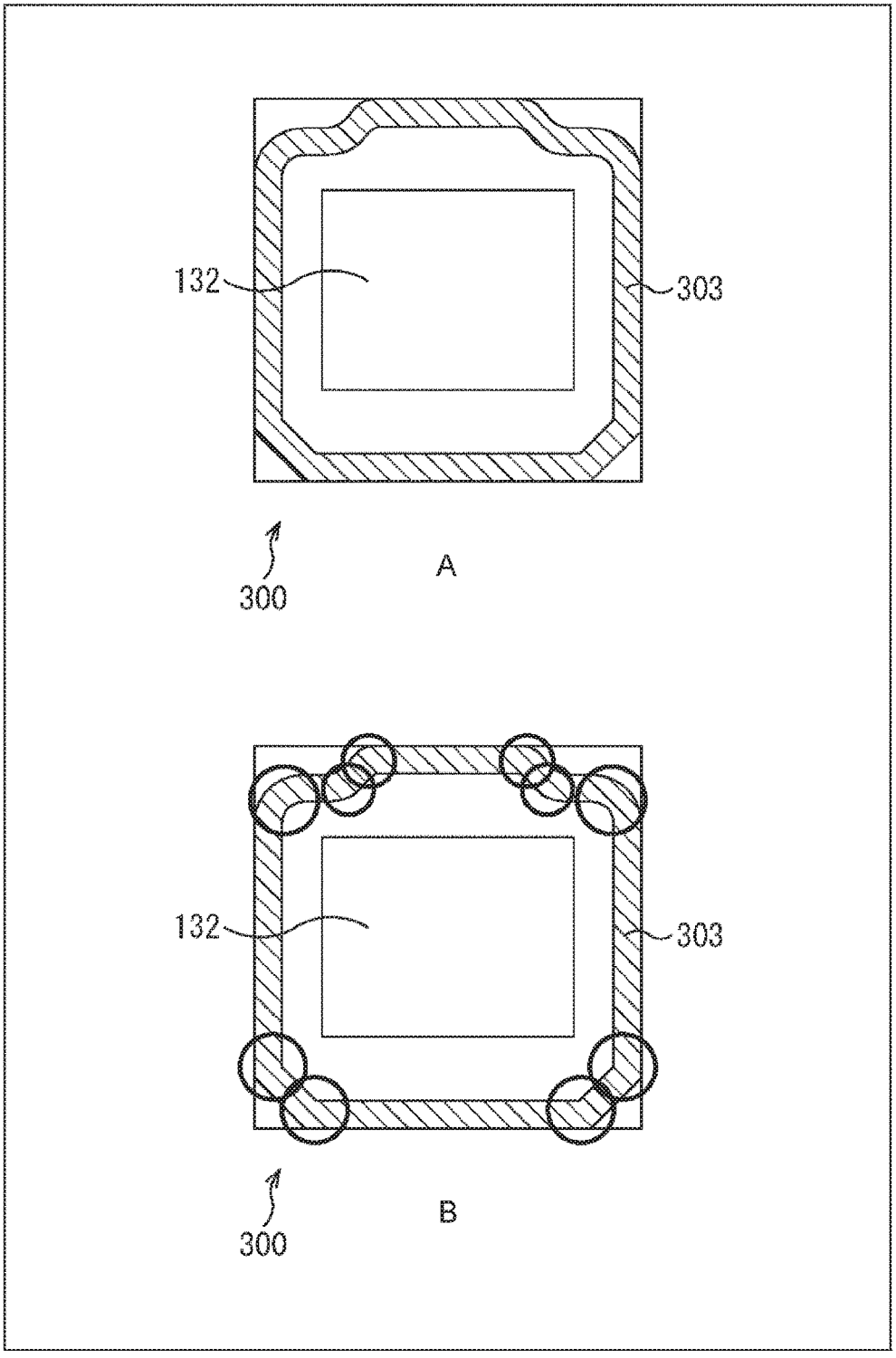


FIG. 8

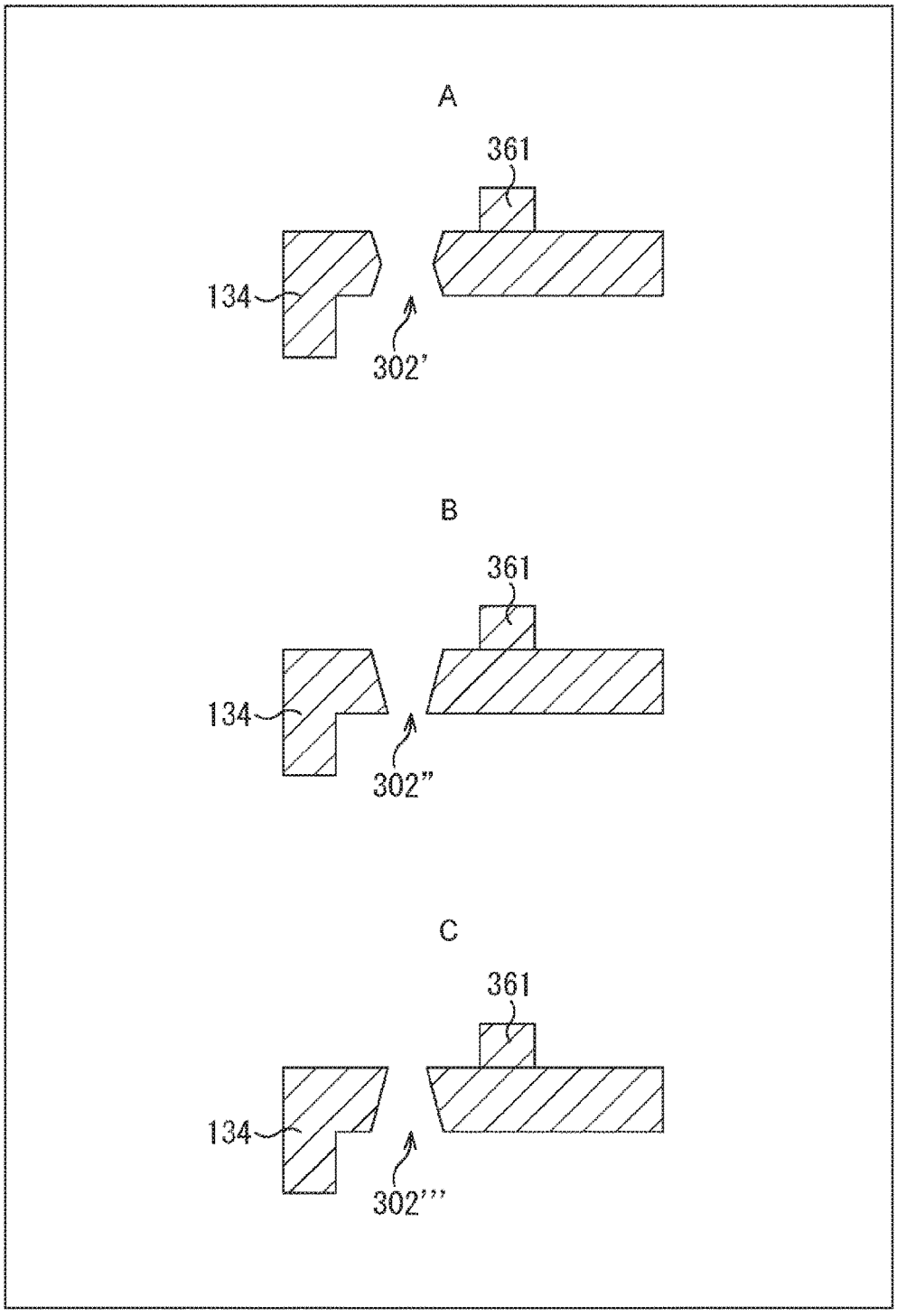
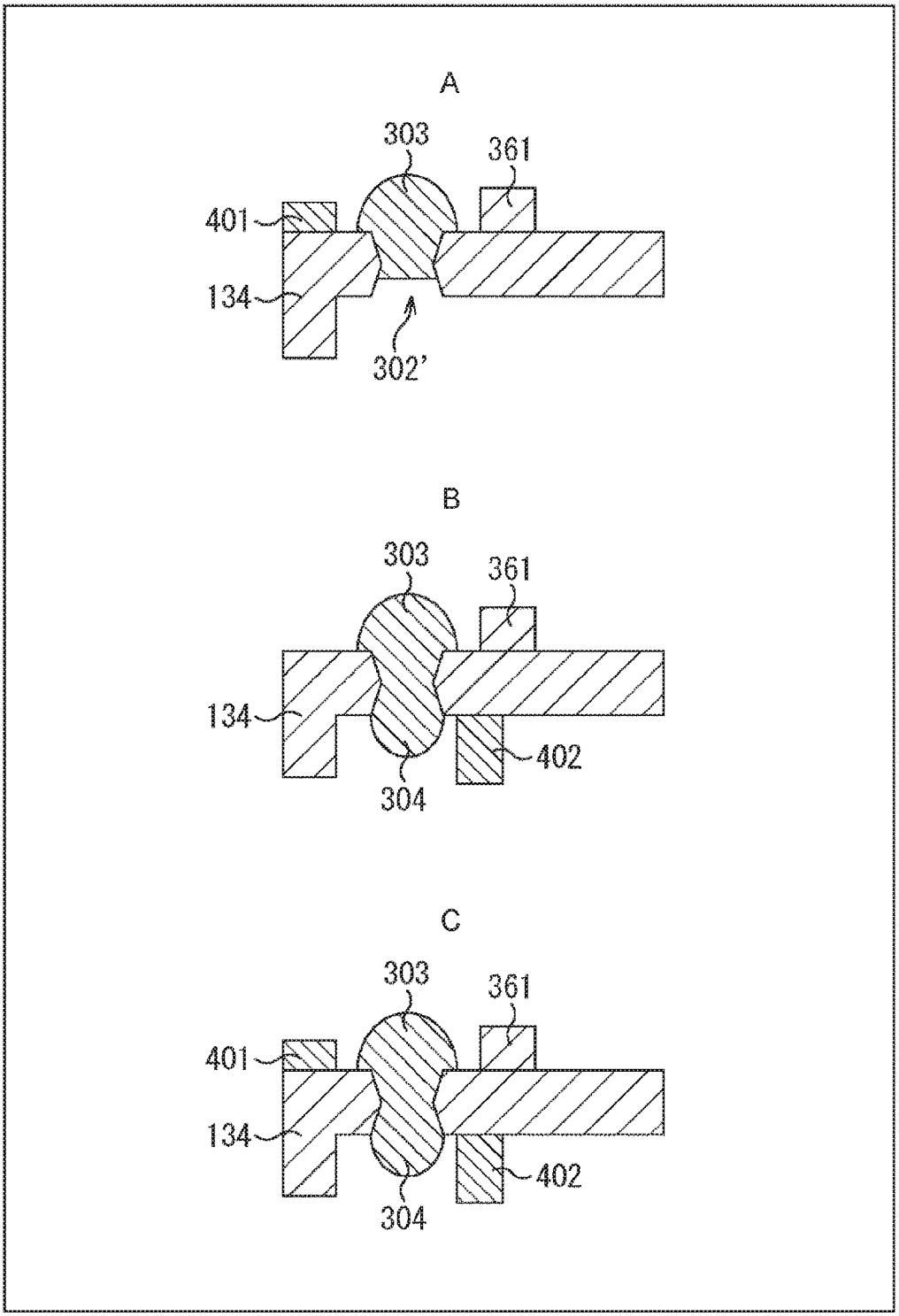


FIG. 9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B
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134
402
304
C
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361
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134
402
304

FIG. 10

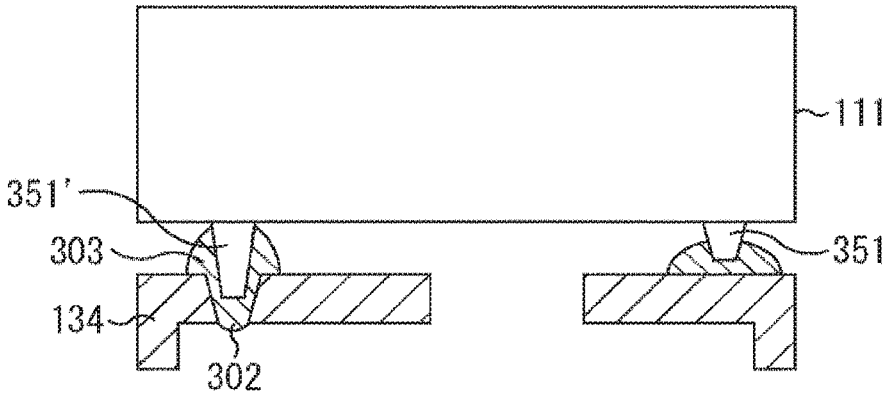


FIG. 11

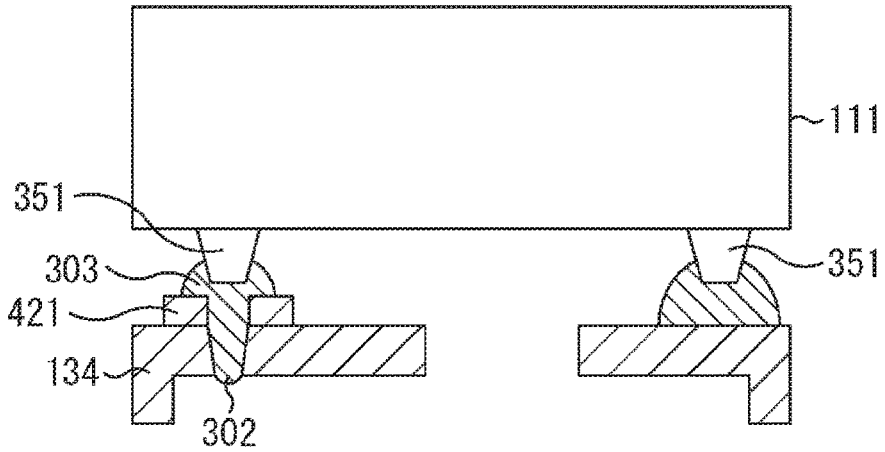


FIG. 12

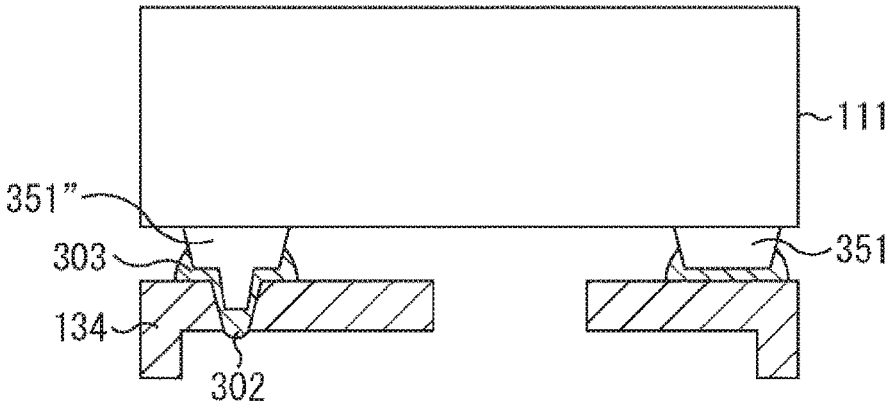


FIG. 13

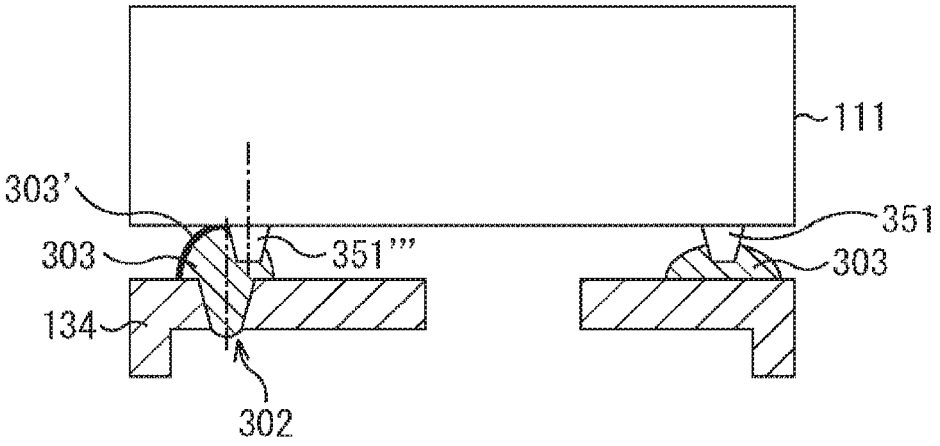


FIG. 14

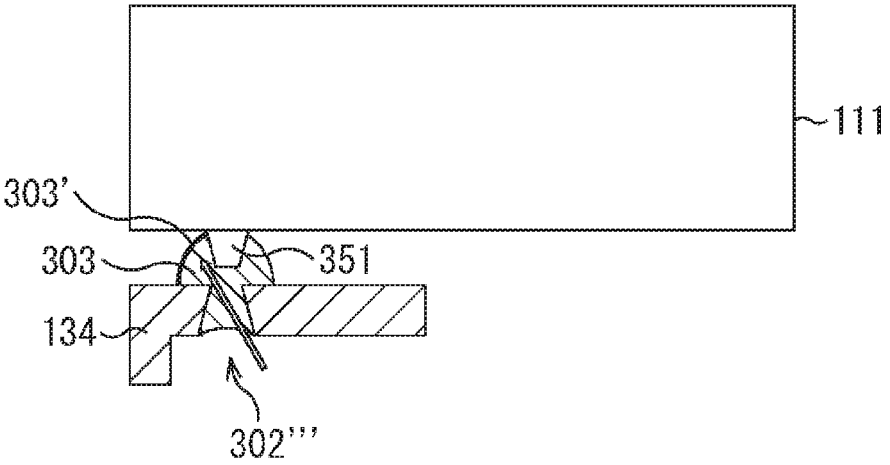


FIG. 15

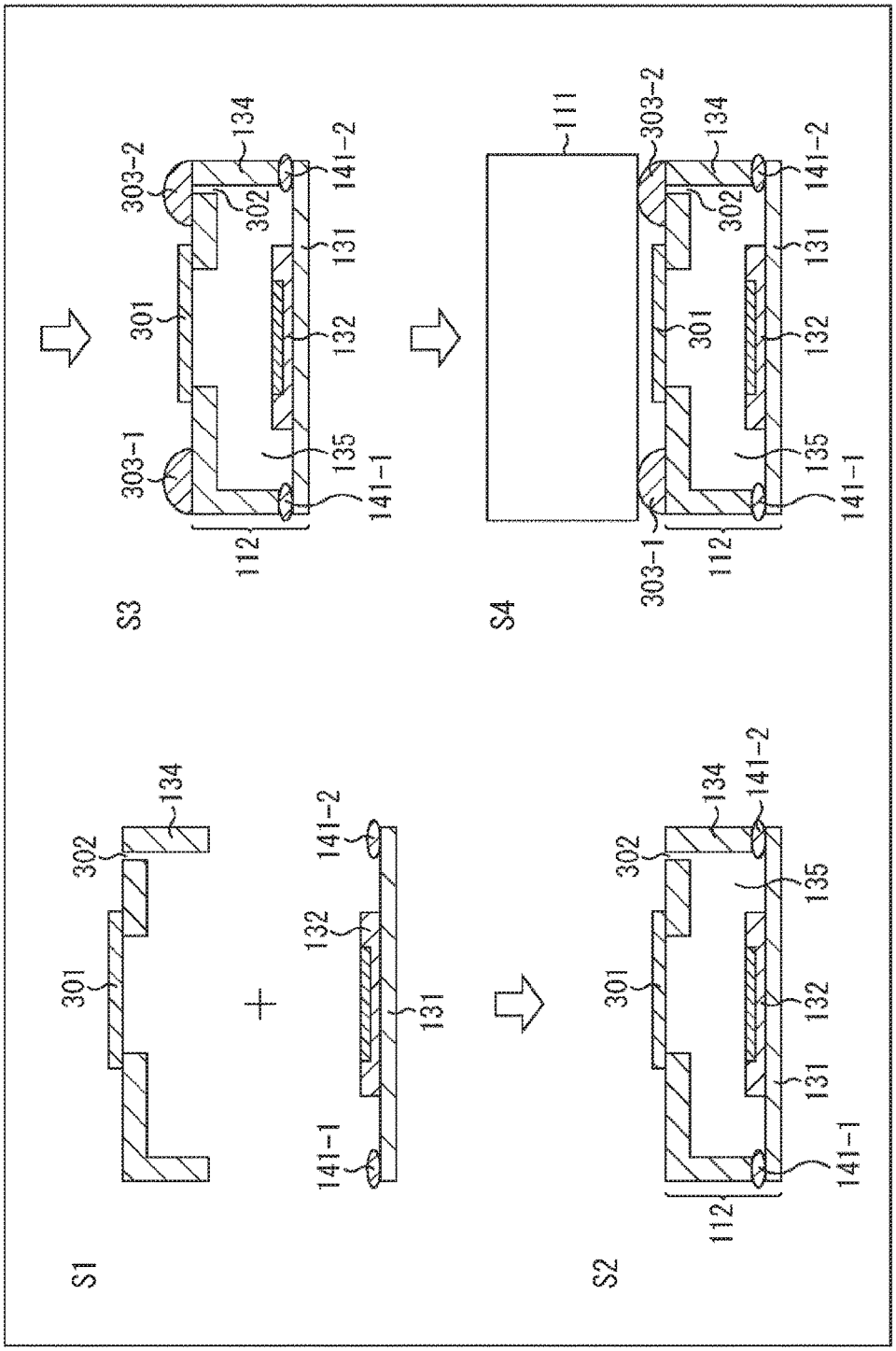
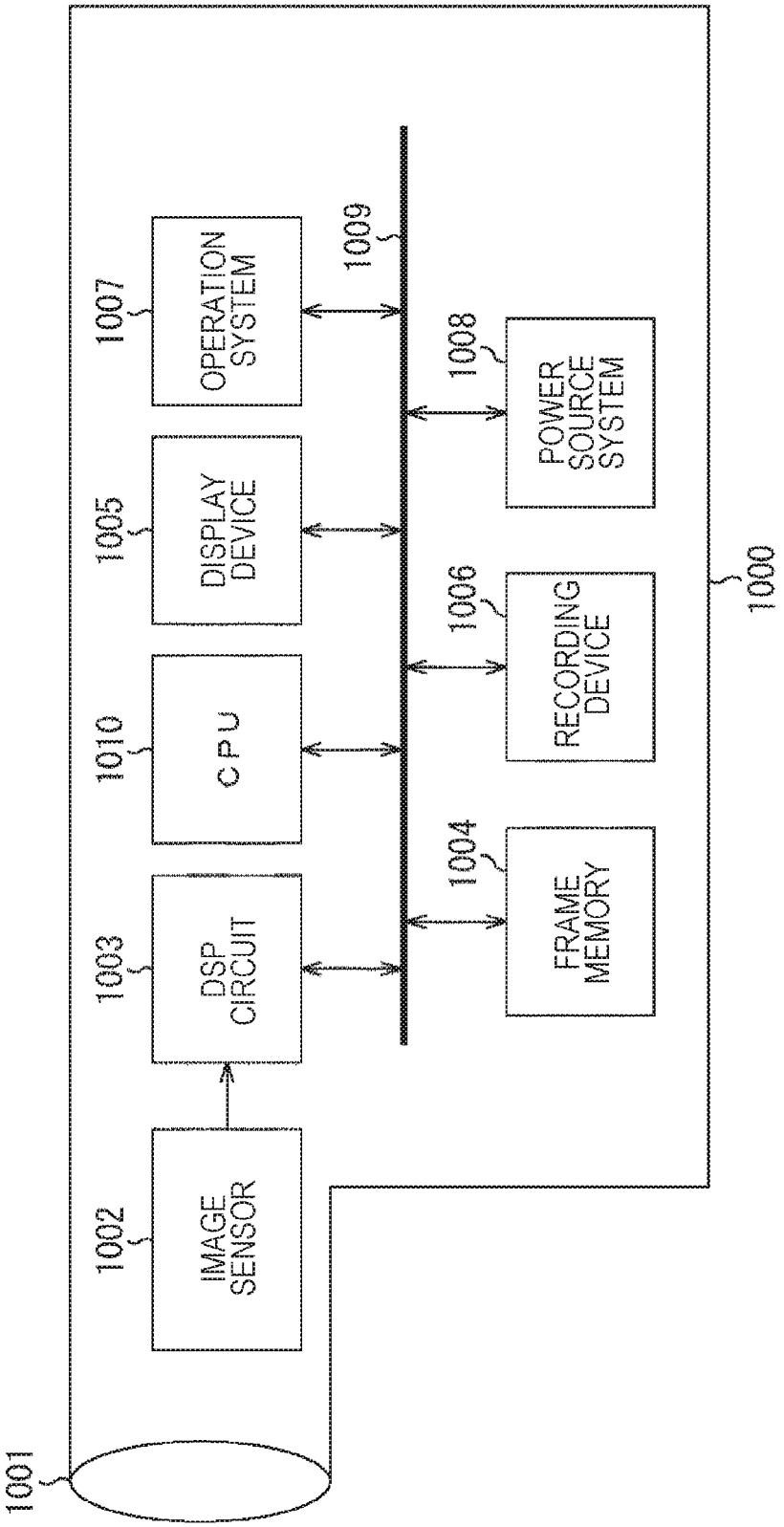


FIG. 16


1000
1001
1002
IMAGE SENSOR
1003
DSP CIRCUIT
1004
FRAME MEMORY
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DISPLAY DEVICE
1006
RECORDING DEVICE
1007
OPERATION SYSTEM
1008
POWER SOURCE SYSTEM
1009
1010
CPU

IMAGING DEVICE, MANUFACTURING DEVICE, AND MANUFACTURING METHOD

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a national stage application under 35 U.S.C. 371 and claims the benefit of PCT Application No PCT/JP2015/068963 having an international filing the benefit of Japanese Patent Application No. 2014-143852 filed 14 Jul. 2014, the disclosures of which are incorporated herein by reference in their entirely.

TECHNICAL FIELD

The present technology relates to an imaging device, a manufacturing device, and a manufacturing method. More specifically, the present technology relates to the imaging device, the manufacturing device, and the manufacturing method for sealing a vent that is required for manufacture and making a closed state.

BACKGROUND ART

In recent years, a digital camera has been reduced in size, and a mobile phone having a function of the digital camera has been widely used. Accordingly, an imaging device is also required to be reduced in size, and a further improvement in quality is also required. Patent Document 1 discloses that when an imaging device is manufactured, a vent for releasing thermally expanded air is provided, and the vent is blocked after the thermally expanded air is released in order to prevent dust or the like from entering through the vent.

CITATION LIST

Patent Document

Patent Document 1: Japanese Patent Application Laid-Open No. 2007-335507

SUMMARY OF THE INVENTION

Problems to be Solved by the Invention

In manufacturing steps for an imaging device, a vent that connects a space including an image sensor to the outside of the space is provided, whereby thermally expanded air in the space can be released. However, if the vent is kept open, dust or the like is likely to enter the space through the vent and, for example, stick onto the image sensor. In this regard, blocking the vent has been proposed in Patent Document 1.

In Patent Document 1, an adhesive is dripped into the vent, whereby the vent is blocked. Therefore, a step for blocking the vent is required independently of other steps. Even though the vent is provided during the manufacturing steps for the imaging device, the vent is required to be capable of being blocked without an increase in the number of manufacturing steps for the imaging device.

The present technology has been made in consideration of these circumstances, and an object thereof is to enable a vent to be blocked without an increase in the number of manufacturing steps for an imaging device.

Solutions to Problems

A first imaging device according to an aspect of the present technology includes: a substrate on which an image sensor is mounted; a frame that fixes an infrared cut filter (IRCF); and a unit including a lens, the image sensor is sealed by the substrate, the IRCF, and the frame, a vent connected to a space in which the image sensor is sealed is provided in a part of the frame, and the vent is blocked by a member that bonds the unit and the frame together.

The vent can be provided in the frame, in a predetermined shape, and in a vertical direction with respect to a surface to which the member is applied.

The vent can have a tapered shape.

The unit can have a leg that is inserted into the member, and the vent can be provided on the frame corresponding to a position right under the leg.

The member can be annularly applied onto the frame, and the vent can be provided on the frame corresponding to a bent portion or a straight portion of the member.

The frame can have a light shielding wall in the vicinity of a position of the vent.

The member can be a light shielding resin.

The leg can be inserted halfway into the vent.

A portion of the frame at which the vent is located can be configured to have a projecting shape so as to come closer to the unit than a portion at which the vent is not located does.

A portion of the leg that is inserted into the member at which the vent is located can have a rib, and the unit can be bonded to the frame in an abutting manner such that the rib is inserted into the vent.

A central axis of the leg and a central axis of the vent can be displaced from each other.

The member can include an ultraviolet curable resin or a resin that is cured by ultraviolet rays and heat.

The vent can have a diameter of 0.2 mm or less.

The vent can be blocked by the leg.

A second imaging device according to an aspect of the present technology includes: a substrate on which an image sensor is mounted; a frame that fixes an infrared cut filter (IRCF); and a unit including a lens, the image sensor is sealed by the substrate, the IRCF, and the frame, a vent connected to a space in which the image sensor is sealed is provided between the frame and the IRCF, and the vent is blocked by a member that bonds the unit and the frame together.

The IRCF can be configured to be large in a direction toward a position of the vent.

The member at a portion where the vent exists can be applied more than the member at a portion where the vent does not exist.

A first manufacturing device according to an aspect of the present technology manufactures an imaging device including: a substrate on which an image sensor is mounted; a frame that fixes an infrared cut filter (IRCF); and a unit bonded to the frame and including a lens, the image sensor is sealed by the substrate, the IRCF, and the frame, a vent connected to a space in which the image sensor is sealed is provided in a part of the frame, and the vent is blocked by a member that bonds the unit and the frame together.

A second manufacturing device according to an aspect of the present technology is configured to, when a substrate on which an image sensor is mounted, a frame to which an infrared cut filter (IRCF) is fixed, and a unit including a lens are bonded together: apply, onto the substrate, a first member for bonding the frame; bond the frame to the substrate using the first member applied onto the substrate; after thermally expanded air is discharged through a vent having a predetermined shape and provided in the frame, apply a second member to a portion including the vent; and bond the frame

and the unit together such that the portion to which the second member has been applied and a part of the unit are bonded together in an abutting manner or spatially.

A manufacturing method according to an aspect of the present technology includes the steps of, when a substrate on which an image sensor is mounted, a frame to which an infrared cut filter (IRCF) is fixed, and a unit including a lens are bonded together: applying, onto the substrate, a first member for bonding the frame; bonding the frame to the substrate using the first member applied onto the substrate; after thermally expanded air is discharged through a vent having a predetermined shape and provided in the frame, applying a second member to a portion including the vent; and bonding the frame and the unit together such that the portion to which the second member has been applied and a part of the unit are bonded together in an abutting manner or spatially.

In the first imaging device according to an aspect of the present technology, the substrate on which the image sensor is mounted, the frame that fixes the infrared cut filter (IRCF), and the unit including the lens are included. In addition, the image sensor is sealed by the substrate, the IRCF, and the frame, the vent connected to the space in which the image sensor is sealed is provided in a part of the frame, and the vent is blocked by the member that bonds the unit and the frame together.

In the second imaging device according to an aspect of the present technology, the substrate on which the image sensor is mounted, the frame that fixes the infrared cut filter (IRCF), and the unit including the lens are included. In addition, the image sensor is sealed by the substrate, the IRCF, and the frame, the vent connected to the space in which the image sensor is sealed is provided between the frame and the IRCF, and the vent is blocked by the member that bonds the unit and the frame together.

In the first manufacturing device and the manufacturing method according to an aspect of the present technology, the first imaging device is manufactured.

In the second manufacturing device according to an aspect of the present technology, when the substrate on which the image sensor is mounted, the frame to which the infrared cut filter (IRCF) is fixed, and the unit including the lens are bonded together: the first member for bonding the frame is applied onto the substrate; the frame is bonded to the substrate using the first member applied onto the substrate; after thermally expanded air is discharged through the vent having a predetermined shape and provided in the frame, the second member is applied to a portion including the vent; and the frame and the unit are bonded together such that the portion to which the second member has been applied and a part of the unit are bonded together.

Effects of the Invention

According to an aspect of the present technology, a vent can be blocked without an increase in the number of manufacturing steps for an imaging device.

Note that the effects described herein are not necessarily limited, and any of effects described in the present disclosure may be obtained.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a diagram illustrating a configuration of an imaging device.

FIG. **2** is a diagram for explaining a step in manufacturing steps for the imaging device.

FIG. **3** is a diagram for explaining a configuration of an imaging device for which a small number of manufacturing steps are used.

FIG. **4** is a diagram for explaining a configuration of an imaging device for which a small number of manufacturing steps are used.

FIG. **5** is a diagram for explaining a configuration of an imaging device for which a small number of manufacturing steps are used.

FIG. **6** is a diagram for explaining a configuration of the imaging device for which a small number of manufacturing steps are used.

FIG. **7** is a diagram for explaining a position at which a vent is provided.

FIG. **8** is a diagram for explaining a shape of the vent.

FIG. **9** is a diagram for explaining a configuration in which a light shielding wall is provided.

FIG. **10** is a diagram for explaining a shape of a leg.

FIG. **11** is a diagram for explaining a shape of the leg.

FIG. **12** is a diagram for explaining a shape of the leg.

FIG. **13** is a diagram for explaining a shape of the leg.

FIG. **14** is a diagram for explaining a shape of the leg.

FIG. **15** is a diagram for explaining the manufacturing steps for the imaging device.

FIG. **16** is a diagram for explaining a configuration of an electronic apparatus.

MODE FOR CARRYING OUT THE INVENTION

Hereinafter, a mode for carrying out the present technology (hereinafter referred to as an "embodiment") will be described. Note that the description will be provided in the following order:

1. Configuration of Imaging Device
2. Configuration of First Imaging Device for Which Reduced Number of Steps Are Used
3. Configuration of Second Imaging Device for Which Reduced Number of Steps Are Used
4. Configuration of Third Imaging Device for Which Reduced Number of Steps Are Used
5. Regarding Position at Which Vent Is Provided
6. Regarding Shape of Vent
7. Regarding Configuration in Which Light Shielding Wall Is Provided
8. Regarding Shape of Leg
9. Regarding Manufacture
10. Electronic Apparatus

<Configuration of Imaging Device>

The present technology can be applied to a camera module including an image sensor and configured to perform a focus adjustment or a camera module that does not perform the focus adjustment. In addition, the camera module to which the present technology is applied is characterized in that steps for manufacture can be reduced as compared with a conventional camera module. In order to clearly explain that the steps for the manufacture can be reduced as compared with the conventional camera module, the conventional camera module (imaging device) will be described first.

FIG. **1** is a cross-sectional diagram illustrating a configuration of the imaging device. The imaging device **10** illustrated in FIG. **1** includes an upper part **11** and a lower part **12**. Hereinafter, the description will be provided on the assumption that the upper part **11** and the lower part **12** constitute the imaging device **10** for convenience of the description.

The upper part **11** includes an actuator **21**, a lens barrel **22**, and a lens **23**. The lower part **12** includes a substrate **31**, an image sensor **32**, an infrared cut filter (IRCF) **33**, and a frame **34**.

Three lenses, i.e., a lens **23-1**, a lens **23-2**, and a lens **23-3**, are incorporated inside the lens barrel **22**, and the lens barrel **22** is configured to hold these lenses **23-1** to **23-3**. The lens barrel **22** is contained in the actuator **21**, and the actuator **21** is attached onto an upper part of the lower part **12**. Note that the description will be continued using the example in which the three lenses are incorporated in the lens barrel **22**. However, a different number of lenses, e.g., three or more lenses, may be incorporated.

For example, an outer side surface of the lens barrel **22** is provided with a screw (not illustrated), and a portion of the inside of the actuator **21** is provided with a screw (not illustrated) at a position that is screwed with the screw of the lens barrel **22**. The screw of the lens barrel **22** and the screw on the inside of the actuator **21** are configured to be screwed with each other.

In a case where the lens barrel **22** is configured to be movable in an up-down direction in the drawing to make a configuration for enabling auto-focus (AF), a coil is provided, for example, on the side surface of the lens barrel **22** (lens holder to which the lens barrel **22** is attached). In addition, a magnet is provided inside the actuator **21** at a position facing the coil. The magnet is provided with a yoke. The coil, the magnet, and the yoke constitute a voice coil motor.

When a current flows in the coil, force is generated in the up-down direction in the drawing. The generated force causes the lens barrel **22** to move in an upward direction or a downward direction. Due to the movement of the lens barrel **22**, a distance between the lenses **23-1** to **23-3** held by the lens barrel **22** and the image sensor **32** is changed. Owing to such a mechanism, the auto-focus can be realized.

Note that, in the following description, the description will be continued on the assumption that the actuator **21** is included in the upper part **11**. However, a configuration that does not include the actuator **21** can also be employed. The upper part **11** is a portion that is referred to as a lens unit or the like. In the following description, the upper part **11** is illustrated by a quadrilateral, and the illustration of the lens **23** or the like is appropriately omitted.

The image sensor **32** is provided in a central part of the lower part **12**. The image sensor **32** is attached onto the substrate **31**, and coupled to the substrate **31** by wiring (not illustrated). Onto a surface of the substrate **31** on which the image sensor **32** is provided, the frame **34** is attached. The frame **34** has a function of holding the IRCF **33**. In addition, on a side of the frame **34** opposite to a side that is in contact with the substrate **31**, the upper part **11** is provided.

In order to prevent a foreign substance such as dust from entering a space **35** surrounded by the substrate **31**, the IRCF **33**, and the frame **34**, the substrate **31**, the IRCF **33**, and the frame **34** adhere to one another so that no gap exists therebetween. The space **35** becomes a substantially closed space by means of the substrate **31**, the IRCF **33**, and the frame **34**.

Consequently, the space **35** is configured to prevent a foreign substance from being introduced thereinto. The IRCF **33** functions as a filter that cuts infrared, and is also used for sealing the image sensor **32** in the space **35**.

When the imaging device **10** is manufactured, the frame **34** is bonded onto the substrate **31** using an adhesive **41-1** and an adhesive **41-2**. A portion of the frame **34** that is in contact with the substrate **31** has a predetermined shape, e.g., a continuous shape such as a quadrilateral, and the adhesive **41** is applied to the continuous portion. Therefore, as illustrated in FIG. **1**, although the adhesive **41-1** and the adhesive **41-2** are represented as different and separate adhesives in the cross-sectional diagram, the adhesive **41-1** and the adhesive **41-2** are formed so as to form a single annular adhesive layer, and continuously applied to the portion of the frame **34** that is in contact with the substrate **31**.

In a similar manner, the frame **34** and the upper part **11** are bonded together using an adhesive **42-1** and an adhesive **42-2**.

The IRCF **33** is bonded to the frame **34** using an adhesive **43** and an adhesive **44**. The adhesive **43** and the adhesive **44** are adhesives that are applied separately at different timings.

The adhesive **44** is applied at the time of the manufacture to block a vent **51** for releasing thermally expanded air to the outside, and to bond the IRCF **33** to the frame **34**.

A configuration of the imaging device **10** during the manufacture is illustrated in FIG. **2**. The imaging device **10** illustrated in FIG. **2** is in a process of manufacturing the lower part **12**, and the lower part **12** to which the upper part **11** is not bonded is illustrated. The IRCF **33** is bonded to the frame **34** using the adhesive **43**, a part of which is provided with the vent **51**.

When the substrate **31** and the frame **34** are bonded together using the adhesive **41-1** and the adhesive **41-2**, air in the space **35** is thermally expanded. The vent **51** is provided in order to release the thermally expanded air. As illustrated by arrows in FIG. **2**, through the vent **51**, the thermally expanded air in the space **35** is discharged through the vent **51** at the outside of the space **35**.

After the substrate **31** and the frame **34** are bonded together, and the thermally expanded air is discharged from the space **35**, the vent **51** is blocked by the adhesive **44**. If the vent **51** is kept open, a foreign substance such as dust is likely to enter the space **35** and stick to the image sensor **32**. In other words, if the vent **51** is kept open, generation of a black spot defect might be caused.

Therefore, the vent **51** is blocked after the substrate **31** and the frame **34** are bonded together. Consequently, the image sensor **32** is sealed by the substrate **31**, the IRCF **33**, and the frame **34**, and the substantially closed space **35** can be produced.

After the vent **51** is blocked, the upper part **11** is bonded to the lower part **12** using the adhesive **42-1** and the adhesive **42-2**.

As described above, although the vent **51** needs to be provided, the step of blocking the vent **51** is required since the vent **51** is provided, and the step of bonding the upper part **11** to the lower part **12** needs to be performed after the step of blocking the vent **51**.

<Configuration of First Imaging Device for which Reduced Number of Steps are Used>

Next, an imaging device for which a small number of steps are used in the manufacture of the imaging device will be described. A of FIG. **3** and B of FIG. **3** are diagrams illustrating a configuration of a first embodiment of the imaging device for which a small number of steps are used. A of FIG. **3** is a diagram illustrating the configuration of the imaging device **100** after the manufacture, and B of FIG. **3** is a diagram illustrating a state of the imaging device **100** during the manufacture.

The imaging device **100** illustrated in A of FIG. **3** includes an upper part **111** and a lower part **112**. In FIG. **3** as well, the description will be provided on the assumption that the

upper part **111** and the lower part **1112** constitute the imaging device **100** for convenience of the description.

The upper part **111** can be configured in a manner similar to that of the upper part **11** illustrated in FIG. **1**. Specifically, the upper part **111** can be configured to include the actuator, the lens barrel, and the lens. In the following description, the description of the upper part **111** is omitted on the assumption that the upper part **111** has the same configuration as the upper part **11**. In addition, the present technology to be described later can be applied to the imaging device configured in such a manner that a unit including the lens is regarded as the upper part **111**, and the upper part **11***i* is bonded to the lower part **112**.

An image sensor **132** is provided in a central part of the lower part **112**. The image sensor **132** is attached onto a substrate **131**, and coupled to the substrate **131** by wiring (not illustrated). Onto a surface of the substrate **131** on which the image sensor **132** is provided, a frame **134** is attached. The frame **134** has a function of holding an IRCF **133**. In addition, on a side of the frame **134** opposite to a side that is in contact with the substrate **131**, the upper part **111** is provided.

In order to prevent a foreign substance such as dust from entering a space **135** surrounded by the substrate **131**, the IRCF **133**, and the frame **134**, the substrate **131**, the IRCF **133**, and the frame **134** adhere to one another so that no gap exists therebetween. The space **135** becomes a substantially closed space by means of the substrate **131**, the IRCF **133**, and the frame **134**.

The imaging device **100** having the space **135** that is the substantially closed space as illustrated in A of FIG. **3** is provided with a vent for releasing thermally expanded air during the manufacture. The configuration of the imaging device **100** during the manufacture is illustrated in B of FIG. **3**.

The IRCF **133** is bonded to the frame **134**. In the same way as the imaging device **10** illustrated in FIGS. **1** and **2**, the frame **134** and the IRCF **133** are bonded together using a bonding material such as an adhesive.

A part of the portion at which the frame **134** and the IRCF **133** are bonded together is provided with a vent **151** connected to the space **135**. The vent **151** can be configured using a gap between the frame **134** and the IRCF **133**.

Since the vent **151** is provided, when the substrate **131** and the frame **134** are bonded together using an adhesive **141-1** and an adhesive **141-2**, thermally expanded air in the space **135** can be discharged to the outside of the space **135**. In a case where a thermosetting resin is used as the adhesive **141**, air in the space **135** is thermally expanded when the thermosetting resin is cured. Therefore, the vent **151** is required for discharging the thermally expanded air.

Note that the adhesive **141** is also annularly applied onto the frame **134** in the same way as described with reference to FIGS. **1** and **2**, and each of the adhesive **141-1***i* and the adhesive **141-2** is an adhesive constituting a portion of an annularly-formed adhesive layer.

After the substrate **131** and the frame **134** are bonded together, and the thermally expanded air is discharged from the space **135** to some extent, the upper part **111** is bonded to the lower part **112** using the adhesive **141-1** and the adhesive **141-2**.

In the imaging device **100** illustrated in FIG. **3**, the vent **151** is blocked by the adhesive **141-2** that is applied when the upper part **111** is bonded to the lower part **112**. In this manner, in order to make sure that the vent **151** is blocked when the upper part **111** is bonded to the lower part **112**, the IRCF **133** is configured to be longer (larger) than the IRCF **33** illustrated in FIG. **2**.

The IRCF **133** illustrated in B of FIG. **3** is formed to be relatively large so that a large portion of the IRCF **133** overlaps the frame **134** on a side provided with the vent **151**. Only a portion of the IRCF **133** that is located above the vent **151** may be configured to be larger than the other portion (shape having a projecting part when viewed from above), or the entire IRCF **133** may have a large shape. For example, in a case where the IRCF **33** illustrated in FIG. **2** has a square shape when viewed from above, the IRCF **133** illustrated in FIG. **3** may be configured to have a rectangular shape so that a large portion of the IRCF **133** overlaps the frame **134**.

As described above, since the IRCF **133** is configured to be larger than the conventional IRCF **33**, the vent **151** can be blocked by the adhesive **142-2** that is applied when the upper part **111** is bonded to the lower part **112**.

As illustrated in A of FIG. **3**, even when the adhesive **142-2** (B of FIG. **3**) is applied at the same position as the adhesive **42-2** in FIG. **1** by the same amount (size), since the IRCF **133** is configured to be large, the IRCF **133** is located so as to reach the position for the application. Therefore, the adhesive **142-2** can be applied at least to a distal end portion of the IRCF **133**. As a result, the vent **151** is blocked by the adhesive **142-2**.

As described above, the IRCF **133** is configured to be large, whereby the vent **151** can be blocked in the step of bonding the upper part **111** to the lower part **112**. In other words, the step for blocking the vent **151** can be omitted.

<Configuration of Second Imaging Device for which Reduced Number of Steps are Used>

Next, another configuration of an imaging device for which a small number of steps are used in the manufacture of the imaging device will be described. A of FIG. **4** and B of FIG. **4** are diagrams illustrating a configuration of a second embodiment of the imaging device for which a small number of steps are used. A of FIG. **4** is a diagram illustrating the configuration of the imaging device **200** after the manufacture, and B of FIG. **4** is a diagram illustrating a state of the imaging device **200** during the manufacture.

Since the imaging device **200** illustrated in FIG. **4** has the same basic configuration as the imaging device **100** illustrated in FIG. **3**, a similar portion is denoted by a similar reference sign, and the description thereof is omitted.

As compared with the imaging device **100** illustrated in A of FIG. **3**, the imaging device **200** illustrated in A of FIG. **4** is different in size of an IRCF and size (application amount) of an adhesive that blocks a vent.

An IRCF **201** of the imaging device **200** illustrated in A of FIG. **4** is configured to be smaller than the IRCF **133** of the imaging device **100** illustrated in A of FIG. **3**. For example, the IRCF **201** can have the same size as the IRCF **33** of the imaging device **10** illustrated in FIG. **1**. In other words, since the conventional IRCF **33** can be used as the IRCF **201** in the imaging device **200**, an IRCF having a new size does not need to be manufactured.

An adhesive **203-2** for the imaging device **200** illustrated in A of FIG. **4** is configured to be larger than the adhesive **142-2** for the imaging device **100** illustrated in A of FIG. **3** and the adhesive **42-2** for the imaging device **10** illustrated in FIG. **1**. The adhesive **203-2** is configured to have such a size and application amount as to cover a part of the IRCF **201**.

As illustrated in B of FIG. **4**, in the process of manufacturing the imaging device **200**, when the frame **134** is bonded to the substrate **131**, a vent **202** for releasing

thermally expanded air in the space **135** to the outside of the space **135** is provided. The vent **202** is blocked by the adhesive **203-2** that is applied when the upper part **111** is bonded to the lower part **112**.

In this manner, in order to make sure that the vent **202** is blocked by the adhesive **203-2** when the upper part **111** is bonded to the lower part **112**, for example, the application amount of the adhesive **203-2** at a portion where the vent **202** is located is more than the application amount at the other portion. Alternatively, a region for the application is expanded to reach the portion where the vent **202** is located as compared with the other portion.

In this manner, the application amount is increased, or a track for the application is extended, whereby the adhesive **203-2** is configured to be large. Consequently, the vent **202** can be blocked by the adhesive **203-2** when the upper part **111** is bonded to the lower part **112**.

As described above, the adhesive **203** at the portion where the vent **202** is located is configured to be larger than that at the other portion, whereby the vent **202** can be blocked in the step of bonding the upper part **111** to the lower part **112**. In other words, the step for blocking the vent **202** can be omitted.

<Configuration of Third Imaging Device for which Reduced Number of Steps are Used>

Next, another configuration of an imaging device for which a small number of steps are used in the manufacture of the imaging device will be described. A of FIG. **5** and B of FIG. **5** are diagrams illustrating a configuration of a third embodiment of the imaging device for which a small number of steps are used. A of FIG. **5** is a diagram illustrating the configuration of the imaging device **300** after the manufacture, and B of FIG. **5** is a diagram illustrating a state of the imaging device **300** during the manufacture.

Since a portion of the imaging device **300** illustrated in FIG. **5** has the same configuration as that of the imaging device **100** illustrated in FIG. **3** and that of the imaging device **200** illustrated in FIG. **4**, a similar portion is denoted by a similar reference sign, and the description thereof is omitted.

A position of a vent of the imaging device **300** illustrated in FIG. **5** is different from that of the imaging device **100** illustrated in FIG. **3** and that of the imaging device **200** illustrated in FIG. **4**. Referring to A of FIG. **5**, an IRCF **301** of the imaging device **300** can have the same size as, for example, the IRCF **33** of the imaging device **10** illustrated in FIG. **1** in the same way as the IRCF **201** of the imaging device **200** illustrated in FIG. **4**. In other words, since the conventional IRCF **33** can be used as the IRCF **301** in the imaging device **300**, an IRCF having a new size does not need to be manufactured.

In addition, in the imaging device **300** illustrated in FIG. **5**, an adhesive **303-2** for bonding the upper part **111** and the lower part **112** together can have a size equivalent to that of the adhesive **42-2** for bonding the upper part **11** and the lower part **12** together in the imaging device **10** illustrated in FIG. **1**. In the imaging device **300** illustrated in FIG. **5**, the vent is configured to be capable of being blocked even without the increase in the application amount of the adhesive **303** or the expansion of the application region.

As illustrated in B of FIG. **5**, the vent **302** of the imaging device **300** is provided in a portion of the frame **134** so as to be connected to the space **135** in a vertical direction (longitudinal direction) with respect to a surface of the frame **134** to which the adhesive **303** is applied. A position at which the vent **302** is provided is a portion to which the adhesive **303-2** is applied. In other words, assuming that when the upper part **111** is bonded to the lower part **112**, the adhesive **303** is applied at the same position and by the same amount as in the portion to which the adhesive **42** for the imaging device **10** illustrated in FIG. **1** is applied, the vent **302** is provided in a portion of a region for the application.

As illustrated in B of FIG. **5**, in the process of manufacturing the imaging device **300**, when the frame **134** is bonded to the substrate **131**, the vent **302** for releasing thermally expanded air in the space **135** to the outside of the space **135** is provided. The vent **302** is blocked by the adhesive **303-2** that is applied when the upper part **111** is bonded to the lower part **112**. Note that although the description is provided using the adhesive **303** as an example, any member that bonds the upper part **111** and the lower part **112** together may be employed.

As described above, the vent **302** is provided in the frame **134** in the longitudinal direction and provided at a position that is blocked by the adhesive **303-2** when the upper part **111** is bonded to the lower part **112**, whereby the vent **302** can be blocked in the step of bonding the upper part **111** to the lower part **112**. In other words, the step for blocking the vent **302** can be omitted.

In the following description, the description will be continued using the imaging device **300** provided with the vent **302** as an example.

FIG. **6** is a diagram illustrating another configuration of the imaging device **300**. In the imaging device **300**, the upper part **111** is provided with a leg **351**. As used herein, the leg is a portion having a projecting shape and provided at a portion of the upper part **11** that is bonded to the lower part **112**.

The leg **351** is, for example, a projecting part having a triangular cross-section as illustrated in FIG. **6**. The leg enters the adhesive **303**, whereby the upper part **111** and the lower part **112** are bonded together. The vent **302** is provided in the frame **134** so that the vent **302** is positioned right under the leg **351**.

As compared with the imaging device **300** illustrated in A of FIG. **5** in which the upper part **111** and the lower part **112** are bonded together in the absence of the leg **351**, the imaging device **300** illustrated in FIG. **6** in which the upper part **111** and the lower part **112** are bonded together in the presence of the leg **351** can increase an area that is bonded to the adhesive **303**, whereby the upper part **111** and the lower part **112** can be bonded together more strongly.

In the imaging device **300** illustrated in FIG. **6**, a light shielding wall **361** is provided on a side of the frame **134** close to the upper part **111**. Since the light shielding wall **361** is provided, the image sensor **132** can be shielded from a stray light component that enters the image sensor **132**. Therefore, image quality can be improved. In addition, since the light shielding wall **361** is provided, the adhesive **303** can be prevented from leaking out to a side close to the IRCF **301**.

As illustrated in FIG. **6**, the present technology can also be applied to the imaging device **300** including the leg **351** and the light shielding wall **361**. In the following description, using the imaging device **300** illustrated in FIG. **6** as an example, shapes of the vent **302** and the leg **351** and how to apply the adhesive **303** or the like will be described.

<Regarding Position at which Vent is Provided>

A of FIG. **7** is a diagram of the imaging device **300** viewed from above. As illustrated in A of FIG. **7**, the adhesive **303** is applied onto the frame **134** so as to surround the image sensor **132**. The leg **351** provided on the upper part **111** is bonded to the portion subjected to the application of the adhesive **303**.

As illustrated in A of FIG. **7**, the adhesive **303** is continuously applied without any break. The leg **351** provided on the upper part **111** is configured to have a predetermined shape such as a triangle when viewed in the cross-section as illustrated in FIG. **6**, but provided in a continuous annular shape when viewed from above.

As illustrated in A of FIG. **7**, although the adhesive **303** may be shaped into a circle or the like, since the image sensor **132** has a quadrilateral shape, the adhesive **303** is formed in a substantially quadrilateral shape so as to surround the image sensor **132**. There are corners in the adhesive **303** formed in the quadrilateral shape. The amount of the adhesive at the corner portion tends to be larger than that at a side portion.

A diagram in which the portion having a large amount of the adhesive **303** is denoted by a circle is illustrated in B of FIG. **7**. On the frame **134**, the vent **302** is provided at a portion corresponding to the portion denoted by the circle. When the vent **302** is provided at the portion having a large amount of the adhesive **303**, the vent **302** can be reliably blocked by the adhesive **303**.

Therefore, the vent **302** can be configured to be provided at the corner portion having a large application amount of the adhesive **303**. In addition, a plurality of the vents **302** can be provided. It is also possible to employ a structure in which a plurality of portions is selected from among the plurality of portions denoted by the circles in B of FIG. **7**, and the vents **302** are provided in the frame **134**. Needless to say, it is possible to employ a structure in which only the single vent **302** is provided. Alternatively, the vent **302** can be provided at a straight portion that is not at the corner.

<Regarding Shape of Vent>

The shape of the vent **302** will be described with reference to FIG. **8**

A vent **302'** illustrated in A of FIG. **8** has a shape tapered in the upward direction and the downward direction. The vent **302'** is formed so that a central portion is narrow and an upper side (side close to the upper part **111**) and a lower side (side close to the image sensor **132**) are wide. The vent **302'** is shaped like combined two cones.

Since the vent **302'** is tapered, a mold can be prevented from being unable to be pulled out when the vent **302'** is formed. When the vent **302'** illustrated in A of FIG. **8** is formed, a mold (pin-shaped metal part) is inserted from the lower side, whereby the lower side below the center of the vent **302'** is formed. A mold is inserted from the upper side, whereby the upper side above the center of the vent **302'** is formed. During this formation, the mold can be prevented from being unable to be pulled out since the shape of the vent **302'** is tapered.

B of FIG. **8** is a diagram illustrating another shape of the vent **302**. A vent **302"** illustrated in B of FIG. **8** also has a tapered shape. The vent **302"** is formed so that an upper side (side close to the upper part **111**) is wide and a lower side (side close to the image sensor **132**) is narrow. When the vent **302"** illustrated in B of FIG. **8** is formed, a mold (pin-shaped metal part) is inserted from the upper side, whereby the vent **302"** is formed.

C of FIG. **8** is a diagram illustrating another shape of the vent **30**. A vent **302'"** illustrated in B of FIG. **8** also has a tapered shape. The vent **302'"** is formed so that an upper side (side close to the upper part **111**) is narrow and a lower side (side close to the image sensor **132**) is wide. When the vent **302'"** illustrated in C of FIG. **8** is formed, a mold (pin-shaped metal part) is inserted from the lower side, whereby the vent **302'"** is formed.

In this manner, since the vent **302** is tapered, the mold can be prevented from being unable to be pulled out at the time of the manufacture as described above. Note that a structure without the taper can be employed in a case where the mold can be pulled out without any problem.

In addition, in a case where a side of the vent **302** on which the adhesive **303** is applied is formed to have a wide bore, the adhesive **303** readily enters the vent **302** when the vent **302** is blocked by the adhesive **303** (FIG. **6**). Moreover, in a case where a side opposite to the side of the vent **302** on which the adhesive **303** is applied is formed to have a narrow bore, the adhesive **303** can be prevented from falling onto the substrate **131** when the vent **302** is blocked by the adhesive **303** (FIG. **6**).

In other words, the vent **302** can be tapered to be formed in such a shape as to enable the vent **302** to be readily filled with the adhesive **303** and to hardly leak the adhesive **303** when the vent **302** is blocked by the adhesive **303**.

The vent **302** configured in this manner can be a circle having a size of, for example, 0.2 mm or less. If the diameter of the vent **302** is large, the vent **302** is not likely to be fully blocked by the adhesive **303**. On the other hand, if the diameter of the vent **302** is small, it is difficult to discharge thermally expanded air, and an influence of the thermally expanded air is likely to be exerted. In this regard, the size of the vent **302** and the number of vents **302** are decided in accordance with, for example, the strength of the mold that is used for forming the vent **302**.

For example, as described above, the vent **302** can be a circle of 0.2 mm or less, or a circle of 0.1 to 0.2 mm. In a case where the vent **302** is tapered, the wide side may be formed to have a diameter of 0.2 man, and the narrow side may be formed to have a diameter of 0.1 mm,

<Regarding Configuration in which Light Shielding Wall is Provided>

Next, a case in which the light shielding wall is provided on the frame **131** will be described. A of FIG. **9** is an example of providing a light shielding wall **401** on an upper side of the frame **134**. As illustrated in A of FIG. **9**, the light shielding wall **401** can be configured to be provided on a side wall side on the surface of the frame **134** to which the upper part **111** is bonded.

Since the light shielding wall **401** is provided, the image sensor **132** can be shielded from light that passes through the adhesive **303** and reaches the image sensor **132**, and flare can be prevented. In addition, the adhesive **303** can be prevented from leaking to the side wall side of the frame **134**.

B of FIG. **9** is an example of providing a light shielding wall **402** on a lower side of the frame **134**. As illustrated in B of FIG. **9**, the light shielding wall **402** can be configured to be provided on a side provided with the IRCF **133** (FIG. **6**) on the surface of the frame **134** close to the imaging device **131** (FIG. **6**).

Since the light shielding wall **402** is provided, the image sensor **132** can be shielded from light that passes through the adhesive **303** and reaches the image sensor **132**, and flare can be prevented. In addition, the adhesive **303** can be prevented from leaking to the side of the frame **134** close to the IRCF **133**.

C of FIG. **9** is an example of providing the light shielding wall **401** on the upper side of the frame **134**, and providing the light shielding wall **402** on the lower side. As illustrated in C of FIG. **9**, the light shielding walls may be provided on the upper and lower sides of the frame **134**. In this case as well, as described with reference to A of FIG. **9** and B of FIG. **9**, since the light shielding walls **401** and **402** are

provided, the image sensor **132** can be shielded from light that passes through the adhesive **303** and reaches the image sensor **132**, and flare can be prevented. In addition, the adhesive **303** can be prevented from leaking to the side wall side of the frame **134** and the side of the frame **134** close to the IRCF **133**.

The description has been provided so far using the case of forming the light shielding wall on the frame **134** as an example. Alternatively, the adhesive **303** itself may be a light shielding resin. The light shielding resin is a resin having a function as the adhesive for bonding the upper part **111** and the lower part **112** together, and having a light shielding function. For example, the light shielding resin is a black resin containing carbon.

Even in the configuration that uses the light shielding resin as the adhesive **303**, the light shielding wall **401** and the light shielding wall **402** can be configured to be provided, thereby achieving the configuration in which the stray light component does not enter the image sensor **132**.

An ultraviolet (UV) curable resin may be used as the light shielding resin. The ultraviolet curable resin is a resin that is polymerized and cured in a short time by ultraviolet energy radiated from an ultraviolet irradiation device. Such an ultraviolet curable resin can be used as the adhesive **303**.

In addition, a resin that is cured by ultraviolet rays and heat may be used as the light shielding resin. As described later, an outer side of the adhesive **303** is temporarily cured by the ultraviolet rays, and an inner side is fully cured by the heat, whereby an air path (passage extending from the space **135** to the outside of the space **135**) can be prevented from being formed in the adhesive **303**.

<Regarding Shape of Leg>

The shape of the leg **351** to be employed in a case where the leg **351** is provided on the upper part **111** will be described with reference to FIGS. **10** to **14**.

FIG. **10** is a diagram illustrating an exemplary shape of the leg **351**. A leg **351'** illustrated in FIG. **10** has such a shape as to come halfway into the vent **302**. In this manner, since the leg **351'** has such a shape as to come halfway into the vent **302**, the vent **302** can be readily blocked.

Note that, as described with reference to FIG. **7**, the leg **351** is annularly provided, and provided to further strengthen the bond to the adhesive **303**. The leg **351'** is provided in such a manner that only a portion of the leg **351** at which the vent **302** is located is longer and more protruding than the other portion of the leg **351** so as to be positioned halfway in the vent **302**.

For example, as illustrated in FIG. **10**, comparing the leg **351** (right side in FIG. **10**) and the leg **351'** (left side in FIG. **10**), the leg **351'** is configured to be longer than the leg **351**. Since the leg **351'** is the leg **351** located at the position where the vent **302** exists, the leg **351'** is formed longer than the other leg **351**. Due to this reason, the leg **351'** is provided like a protrusion having a projecting shape with respect to the leg **351**.

Since the leg **351'** is shaped to be inserted halfway into the vent **302**, even though, for example, the application amount of the adhesive **303** is the same as the application amount in a place other than the vent **302**, the adhesive **303** is pushed out to the vent **302** by the leg **351'** when the upper part **111** is bonded to the lower part **112**, and the vent **302** can be blocked more reliably.

Instead of providing the protruding portion (leg **351'**) on the annularly-provided leg **351**, a projecting part may be provided on a side close to the vent **302**. A configuration in which a projecting part **421** is provided on a portion at the vent **302** is illustrated in FIG. **11**.

As illustrated in FIG. **11**, the projecting part **421** is provided at the portion where the vent **302** is located on the surface of the frame **134** close to the upper part **111**. The projecting part **421** has such a shape that a central portion is connected to the vent **302**, and the central portion has a hole.

When the adhesive **303** is applied onto this projecting part **421**, and the leg **351** is pressed on the adhesive **303**, the adhesive **303** is pushed out to the hole provided in the central portion of the projecting part **421**, and further pushed out to the vent **302** connected to the hole. Consequently, the vent **302** can be blocked by the adhesive **303** more reliably.

As described above, the portion of the frame **134** at which the vent **302** is provided can be configured to be formed higher than the portion at which the vent **302** is not provided, and the projecting part **421** can be configured to be provided at the position close to the leg **351**.

FIG. **12** is a diagram for explaining another shape of the leg **351**. A leg **351"** illustrated in FIG. **12** has a shape including a rib (bank). As illustrated in FIG. **12**, the leg **351"** at the portion where the vent **302** is located is shaped in such a manner that the rib is provided on the leg **351** at the portion where the vent **302** is not located. The rib portion of the leg **351"** has such a shape as to come into the vent **302**.

The upper part **111** having the leg **351"** illustrated in FIG. **12** can be applied to a single focus camera and a camera without optical correction (the above-mentioned lens movement correction is not performed). In addition, since the leg **351"** having the rib is used, when the upper part **111** and the lower part **112** are bonded together in an abutting manner without the optical correction (without the lens movement correction), the upper part **111** can be guided to an accurate position for the bond to the lower part **112**. Specifically, the upper part **111** is moved so that the rib is positioned in the vent **302**, whereby the upper part **111** can be guided to the accurate position for the bond to the lower part **112**.

The leg **351** described with reference to FIGS. **10** to **12** is based on the premise that a central axis of the leg **351** and a central axis of the vent **301** are substantially the same. Next, the leg **351** shaped in such a manner that the central axis of the leg **351** and the central axis of the vent **301** are displaced from each other will be described with reference to FIG. **13**.

A central axis of a leg **351'"** illustrated in FIG. **13** and the central axis of the vent **302** are located at displaced positions. In FIG. **13**, the central axis is represented by a dashed-dotted line. The central axis of the leg **351'"** is located inside the central axis of the vent **302** (on a side close to the IRCF **133**).

In this manner, since the central axis of the leg **351'"** and the central axis of the vent **302** are displaced from each other, even if air in the space **135** is thermally expanded after the vent **302** is blocked by the adhesive **303**, and force is applied from the space **135** to the vent **302**, it is possible to prevent the space **135** from being connected to the outside of the space **135** through a hole that is made in the adhesive **303** due to the force. In other words, the formation of the air path can be prevented.

In a case where the ultraviolet curable resin is used as the adhesive **303**, the outer side of the adhesive **303** becomes cured. In FIG. **13**, a cured portion of the adhesive **303** is represented by a thick line and denoted as an adhesive **303'**.

Owing to the presence of the cured adhesive **303'**, even if the air path is generated, the air path can be stopped by the cured adhesive **303'**. Consequently, it is possible to prevent the space **135** from being connected to the outside of the space **135** by the air path.

In this manner, the central axis of the leg **351'''** and the central axis of the vent **302** may be configured to be displaced from each other. In addition, the ultraviolet curable resin may provide a mechanism for curing (temporarily curing) the outer side of the adhesive **303** in advance of the inner side.

FIG. **14** is a diagram illustrating another configuration of the leg **351** and the vent **302** configured in such a manner that the ultraviolet curable resin is used as the adhesive **303** and temporarily cured to prevent the generation of the air path. The vent **302** is formed in the tapered shape having the wide lower side and the narrow upper side. In addition, in the same way as the adhesive **303** illustrated in FIG. **13**, the ultraviolet curable resin is used as the adhesive **303**, and the outer side of the adhesive **303** is configured to be temporarily cured.

Owing to this configuration, even in the occurrence of a situation where the air path is likely to be generated since air in the space **135** is thermally expanded and the adhesive **303** is pushed up as illustrated by an arrow in FIG. **14**, the air path is stopped by the temporarily cured adhesive **303'** and can be prevented from being connected to the outside.

Moreover, since the taper is formed downward, the amount of the adhesive **303** on the lower side of the vent **302** is increased. Therefore, even if the adhesive **303** is pushed up by the thermally expanded air, the push-up force is reduced, and the adhesive **303** can be prevented from being further pushed away.

In this manner, the generation of the air path can be prevented owing to the shape of the vent **302** and the material for the adhesive **303**.

In the above-mentioned embodiment, the example of blocking the vent **302** by means of the adhesive **303** has been described. Alternatively, the vent **302** may be blocked by the leg **351**, not by the adhesive **303**.

For example, in a case where the leg **351** is configured to enter the vent **302** as described with reference to FIGS. **10** and **12**, the vent **302** may be blocked by the leg **351**. According to the present technology, the leg **351** and the vent **302** can be formed in such a size and shape as to enable the leg **351** to block the vent **302**.

In a case where the vent **302** is configured to be blocked by the leg **351**, in the same way as in the above-mentioned embodiment, the vent **302** can be blocked when the upper part **111** is bonded to the lower part **112**. Therefore, the vent **302** can be blocked without an increase in the number of steps.

According to the present technology, when the vent that is required in the steps is blocked for the improvement in the reliability, the vent can be filled with the resin in the latter step so that the blocking step is not added later. Consequently, the blocking step can be reduced, and the effect of a reduction in processing costs can be expected.

<Regarding Manufacture>

Next, the manufacturing steps for the above-mentioned imaging device will be described with reference to FIG. **15**. The description that is provided with reference to FIG. **15** is the description of the manufacture of the imaging device **300** illustrated in FIG. **5**. However, the imaging devices including other configurations can also be manufactured in similar steps.

In step S**1**, the lower part **112** is manufactured. The IRCF **301** is fixed to the frame **134**. The IRCF **301** may be fixed to the frame **134** by an adhesive, or may be fixed in such a manner that a cut is made in the frame **134**, and the IRCF **301** is fixed in the cut.

In addition, the frame **134** is provided with the vent **302**. The vent **302** is shaped, for example, as described with reference to FIGS. **8**A to **14**.

The image sensor **132** is attached onto the substrate **131**, and the wiring or the like is also installed. The adhesive **141** is applied onto this substrate **131**. The adhesive **141** is annularly applied, and the frame **134** is placed on this adhesive **141**, whereby the substrate **131** and the frame **134** are bonded together.

In step S**2**, thermally expanded air is discharged through the vent **302**. In a case where the thermosetting resin is used as the adhesive **141**, air in the space **135** is also heated when the substrate **131** and the frame **134** are bonded together, and likely to be thermally expanded. The thermally expanded air is discharged to the outside of the frame **134** through the vent **302**.

In step S**3**, the adhesive **303** for bonding the upper part **111** is applied onto the frame **134**. The application of the adhesive **303** means that the adhesive **303** is applied onto the vent **302** as well, and the vent **302** is blocked. In other words, the adhesive **303** is applied to a region including the portion of the frame **134** at which the vent **302** is provided. The vent **302** is blocked.

Note that the adhesive **141** that bonds the substrate **131** and the frame **134** together and the adhesive **303** that bonds the frame **134** and the upper part **111** together may be members made of different materials, or may be the same member.

In step S**4**, the upper part **111** is placed on the applied adhesive **303**, and bonded to the lower part **112**. As described above, the upper part **111** is provided with the leg **351**, and the vent **302** is formed in the tapered shape. Consequently, the adhesive **303** can be pushed into the vent **302** to block the vent **302** more reliably, and the generation of the air path can be prevented.

The imaging device **300** is manufactured in this manner. A step only for blocking the vent **302** is not included, and the vent **302** is blocked when the upper part **111** is bonded to the lower part **112**. Therefore, even though a new step only for blocking the vent **302** is not added, the vent **302** can be blocked, the thermally expanded air can be discharged to the outside, and the vent **302** can be blocked after that.

According to the present technology, when the vent that is required in the steps is blocked for the improvement in the reliability, the vent can be filled with the resin in the latter step so that the blocking step is not added later. Consequently, the blocking step can be reduced, and the effect of the reduction in the processing costs can be expected.

<Electronic Apparatus>

The present technology is not limited to the application to the imaging device, and can be generally applied to an electronic apparatus in which an imaging device is used for an image taking unit (photoelectric conversion unit). Examples of the electronic apparatus include an imaging device such as a digital still camera and a video camera, a mobile terminal device having an imaging function such as a mobile phone, and a copier in which an imaging device is used for an image reading unit. Note that a modular form mounted on the electronic apparatus, that is, a camera module, may serve as the imaging device.

FIG. **1.6** is a block diagram illustrating an exemplary configuration of the imaging device that is an example of the electronic apparatus of the present disclosure. As illustrated in FIG. **16**, the imaging device **1000** of the present disclosure has, for example, an optical system including a lens group **1001** or the like, an image sensor **1002**, a DSP circuit **1003** that is a camera signal processing unit, a frame memory

1004, a display device 1005, a recording device 1006, an operation system. 1007, and a power source system 1008.

Moreover, the DSP circuit 1003, the frame memory 1004, the display device 1005, the recording device 1006, the operation system 1007, and the power source system 1008 are configured to be coupled to one another via a bus line 1009. A CPU 1010 controls each component in the imaging device 1000.

The lens group 1001 obtains incident light (image light) from an object, and forms an image on an imaging surface of the image sensor 1002. The image sensor 1002 converts, into an electric signal on a pixel basis, the quantity of light of the incident light from which the image has been formed on the imaging surface by the lens group 1001. The image sensor 1002 then outputs the electric signal as a pixel signal. The solid state image sensor according to the aforementioned embodiment can be used as the image sensor 1002.

The display device 1005 includes a panel type display device such as a liquid crystal display device and an organic electro luminescence (EL) display device. The display device 1005 displays a moving image or a still image captured by the image sensor 1002. The recording device 1006 records the moving image or the still image captured by the image sensor 1002 in a recording medium such as a videotape and a digital versatile disk (DVD).

The operation system 1007 gives operation instructions about various functions of the present imaging device under the control of a user. The power source system 1008 appropriately supplies, to supply targets, various power sources that serve as operation power sources for the supply targets, namely, the DSP circuit 1003, the frame memory 1004, the display device 1005, the recording device 1006, and the operation system 1007.

The above-mentioned imaging device 1000 is applied to a video camera or a digital still camera, and a camera module for a mobile apparatus such as a mobile phone. In addition, in the imaging device 1000, for example, the imaging device 300 according to the aforementioned embodiment can be used as the lens group 1001 and the image sensor 1002.

Note that the effects described in the present description are only examples, and are not limited to these effects. Other effects may also be obtained.

Note that the embodiment of the present technology is not limited to the above-mentioned embodiment, and can be variously changed in a range not departing from the gist of the present technology.

Note that the present technology can also be configured as follows.

(1) An imaging device including:
a substrate on which an image sensor is mounted;
a frame that fixes an infrared cut filter (IRCF); and
a unit including a lens, wherein
the image sensor is sealed by the substrate, the IRCF, and the frame,
a vent connected to a space in which the image sensor is sealed is provided in a part of the frame, and
the vent is blocked by a member that bonds the unit and the frame together.

(2) The imaging device according to (1), wherein
the vent is provided in the frame, in a predetermined shape, and in a vertical direction with respect to a surface to which the member is applied.

(3) The imaging device according to (1) or (2), wherein
the vent has a tapered shape.

(4) The imaging device according to any of (1) to (3), wherein
the unit has a leg that is inserted into the member, and
the vent is provided on the frame corresponding to a position right under the leg.

(5) The imaging device according to any of (1) to (4), wherein
the member is annularly applied onto the frame, and
the vent is provided on the frame corresponding to a bent portion or a straight portion of the member.

(6) The imaging device according to any of (1) to (5), wherein
the frame has a light shielding wall in the vicinity of a position of the vent.

(7) The imaging device according to any of (1) to (6), wherein
the member is a light shielding resin.

(8) The imaging device according to (4), wherein
the leg is inserted halfway into the vent.

(9) The imaging device according to any of (1) to (8), wherein
a portion of the frame at which the vent is located is configured to have a projecting shape so as to come closer to the unit than a portion at which the vent is not located does.

(10) The imaging device according to (4), wherein
a portion of the leg that is inserted into the member at which the vent is located has a rib, and
the unit is bonded to the frame in an abutting manner such that the rib is inserted into the vent.

(11) The imaging device according to (4), wherein
a central axis of the leg and a central axis of the vent are displaced from each other.

(12) The imaging device according to any of (1) to (11), wherein
the member includes an ultraviolet curable resin or a resin that is cured by ultraviolet rays and heat.

(13) The imaging device according to any of (1) to (12), wherein
the vent has a diameter of 0.2 mm or less.

(14) The imaging device according to (4), wherein
the vent is blocked by the leg.

(15) An imaging device including:
a substrate on which an image sensor is mounted;
a frame that fixes an infrared cut filter (IRCF); and
a unit including a lens, wherein
the image sensor is sealed by the substrate, the IRCF, and the frame,
a vent connected to a space in which the image sensor is sealed is provided between the frame and the IRCF, and
the vent is blocked by a member that bonds the unit and the frame together.

(16) The imaging device according to (15), wherein
the IRCF is configured to be large in a direction toward a position of the vent.

(17) The imaging device according to (115), wherein
the member at a portion where the vent exists is applied more than the member at a portion where the vent does not exist.

(18) A manufacturing device that manufactures an imaging device, the imaging device including:
a substrate on which an image sensor is mounted;
a frame that fixes an infrared cut filter (IRCF); and
a unit bonded to the frame and including a lens, wherein
the image sensor is sealed by the substrate, the IRCF, and the frame,
a vent connected to a space in which the image sensor is sealed is provided in a part of the frame, and
the vent is blocked by a member that bonds the unit and the frame together.

(19) A manufacturing device configured to, when a substrate on which an image sensor is mounted, a frame to which an infrared cut filter (IRCF) is fixed, and a unit including a lens are bonded together:

apply, onto the substrate, a first member for bonding the frame;

bond the frame to the substrate using the first member applied onto the substrate;

after thermally expanded air is discharged through a vent having a predetermined shape and provided in the frame, apply a second member to a portion including the vent; and

bond the frame and the unit together such that the portion to which the second member has been applied and a part of the unit are bonded together in an abutting manner or spatially.

(20) A manufacturing method including the steps of, when a substrate on which an image sensor is mounted, a frame to which an infrared cut filter (IRCF) is fixed, and a unit including a lens are bonded together:

applying, onto the substrate, a first member for bonding the frame;

bonding the frame to the substrate using the first member applied onto the substrate;

after thermally expanded air is discharged through a vent having a predetermined shape and provided in the frame, applying a second member to a portion including the vent; and

bonding the frame and the unit together such that the portion to which the second member has been applied and a part of the unit are bonded together in an abutting manner or spatially.

REFERENCE SIGNS LIST

111 Upper part
112 Lower part
131 Substrate
132 Image sensor
134 Frame
141 Adhesive
300 Imaging device
301 IRCF
302 Vent
303 Adhesive
351 Leg

What is claimed is:

1. An imaging device comprising:
a substrate on which an image sensor is mounted;
a frame that fixes an infrared cut filter (IRCF); and
a unit including a lens,
wherein the image sensor is sealed by the substrate, the IRCF, and the frame,
wherein a vent connected to a space in which the image sensor is sealed is provided in a part of the frame,
wherein the vent is blocked by a member that bonds the unit and the frame together,
wherein the unit has a leg that is inserted into the member,
wherein the vent is provided on the frame corresponding to a position right under the leg,
and wherein the leg is inserted halfway into the vent.

2. The imaging device according to claim **1**, wherein the vent is provided in the frame, in a predetermined shape, and in a vertical direction with respect to a surface to which the member is applied.

3. The imaging device according to claim **1**, wherein the vent has a tapered shape.

4. An imaging device comprising:
a substrate on which an image sensor is mounted;
a frame that fixes an infrared cut filter (IRCF); and
a unit including a lens,
wherein the image sensor is sealed by the substrate, the IRCF, and the frame,
wherein a vent connected to a space in which the image sensor is sealed is provided in a part of the frame,
wherein the vent is blocked by a member that bonds the unit and the frame together,
wherein the unit has a leg that is inserted into the member,
wherein the vent is provided on the frame corresponding to a position right under the leg,
wherein a portion of the leg that is inserted into the member at which the vent is located has a rib, and
wherein the unit is bonded to the frame in an abutting manner such that the rib is inserted into the vent.

5. The imaging device according to claim **4**, wherein the vent is provided in the frame, in a predetermined shape, and in a vertical direction with respect to a surface to which the member is applied.

6. The imaging device according to claim **4**, wherein the vent has a tapered shape.

7. An imaging device comprising:
a substrate on which an image sensor is mounted;
a frame that fixes an infrared cut filter (IRCF); and
a unit including a lens,
wherein the image sensor is sealed by the substrate, the IRCF, and the frame,
wherein a vent connected to a space in which the image sensor is sealed is provided in a part of the frame,
wherein the vent is blocked by a member that bonds the unit and the frame together,
wherein the unit has a leg that is inserted into the member,
wherein the vent is provided on the frame corresponding to a position right under the leg, and
wherein the vent is blocked by the leg.

8. The imaging device according to claim **7**, wherein the vent is provided in the frame, in a predetermined shape, and in a vertical direction with respect to a surface to which the member is applied.

9. The imaging device according to claim **7**, wherein the vent has a tapered shape.

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